REMARKS

The Examiner's action dated June 29, 2009, has been received, and its contents carefully noted.

In response to the objection to the specification, the specification has been amended to eliminate the references to claim 1.

In response to the claim objections presented in Section 4 and the claim rejections presented in Section 5 of the action, claims 1-8 have been cancelled and replaced by new claims 19-24, drafted to be free of all of the informalities noted by the Examiner. All of the new claims are in singly dependent form.

New independent claim 9 has been drafted to clarify that the field concentrator is rotatable relative to the stator. In addition, claim 9 has been drafted to provide a positive recitation of the pole shoes on the rotor, as well as of the pole shoes on the field concentrator.

Accordingly, it is requested that these objections and formal rejections be reconsidered and withdrawn.

The rejection of the original claims as unpatentable over Rodenhuis in view of Schulze is respectfully traversed for the reason that the novel magnetodynamic transmission according to the present invention is not disclosed in, or suggested by any combination of the teachings of, the applied references.

The present invention, particularly as now defined in claim 9, is directed to a magnetodynamic transmission having three basic components: an input rotor provided with magnets and pole shoes, a coaxial field concentrator comprising magnetically conductive pole shoes and radially surrounding the input rotor, and a coaxial stator having grooves and windings in the grooves, the windings being

sequentially short circuited during operation, the stator radially surrounding the field concentrator and the field concentrator being rotatable relative the stator.

Such a structural arrangement is not disclosed in or suggested by the applied references.

Each of the applied references discloses an electrodynamic gear, or transmission, which is, by definition, based on a different operating principle than a magnetodynamic transmission. The abstract of the Rodenhuis reference clearly identifies the machines disclosed therein as electrodynamic. The Schulze machine is also electrodynamic in that energy is transferred by electric currents between two magnet assemblies.

As a first point, neither of the applied references discloses a field concentrator comprising magnetically conductive pole shoes.

In the explanation of the rejection of claim 1, the Examiner asserts that the windings 16 and associated poles of the Rodenhuis reference constitute "magnets". It is submitted that such an interpretation of a winding and poles goes far beyond anything that can be considered to be a reasonable interpretation of the reference disclosure. No one skilled in the art would consider windings with poles to be magnets.

Moreover, claim 9 specifies that the rotor includes magnets <u>and</u> pole shoes, which means that the magnets are components distinct from the pole shoes. The poles disclosed by Rodenhuis cannot both be parts of "magnets" and components in addition to "magnets". Logically, therefore, the claimed magnets could only be compared to the windings of Rodenhuis and windings, by themselves, cannot be considered to constitute magnets.

Attention is additionally drawn to the fact that new claim 24, which depends directly from claim 9, specifies that the input rotor magnets are permanent magnets. Support for this language will be found in the present specification, at page 2, line 2.

Furthermore, claim 9 defines a coaxial stator having windings that are sequentially short-circuited during operations. In the explanation of the rejection of claim 1, the Examiner acknowledges that Rodenhuis does not disclose the possibility of sequentially short-circuiting the stator windings, but makes the assertion that inverters 5a/6a are "capable" of this operation The basis for such an assertion is not understood. As the Examiner acknowledges, the reference certainly does not disclose that the inverters have this capability and it is believed that inverters would not inherently have such a capability unless they were intentionally configured and associated with control means constructed to perform such a function. It is therefore submitted that there is no basis in fact for the view that Rodenhuis discloses windings that are "sequentially short-circuited during operation".

In further support of the rejection, reliance is placed on the disclosure of the U.S. patent to Schulze and the examiner asserts that this reference discloses windings 11 that are to be "sequentially short-circuitable by switches 18". No disclosure of this capability has been found in the applied reference. In the explanation of the rejection, the Examiner refers to column 2, lines 55-64 and column 4, lines 26-29. Neither of those portions of the Schulze specification mention either sequential short-circuiting, or more than one winding.

Therefore, it is submitted that this reference does not appear to disclose the feature that the Examiner asserts to support the rejection.

Furthermore, it is not seen that any basis exists for the assertion that it would somehow be "obvious" to combine various features of the applied references in any particular matter.

It is quite clear that these two references disclose distinctly different devices which, although they are both electrodynamic devices, operate according to essentially different technical principles. While Rodenhuis discloses a machine having two sets of windings and a single set of magnets, with all of these components being radially spaced from one another, Schulze discloses a machine having a single winding and two sets of magnets, with the magnets being axially, but not radially, offset from one another. It is thus clear that these machines operate according to different principles, and it is not seen that one skilled in the art could find any motivation for combining their teachings in any particular manner.

In any event, even if the teachings of these references could be combined, the fact remains that neither reference discloses two rotatable parts composed of magnets or magnetically conductive pole shoes, together with a stator, in which the three components are radially offset from one another, and neither of the applied references discloses a machine having stator windings that are sequentially short-circuited during operation.

These novel features are now clearly defined in independent claim 9.

They will now be presented below in more detailed discussion of the technical differences between the present invention and the applied references.

The essential difference between the present invention, as now claimed, and Rodenhuis (which played a decisive role in the course of the European examination procedure) is that the present invention concerns an infinitely variable magnetodynamic transmission, and not an electromagnetic transmission as described in the cited references.
The primary reference relied upon to support the present rejections, Rodenhuis, was also considered the closest prior art in the European procedure.

Rodenhuis explicitly discloses an electrodynamic, or induction, machine that operates asynchronously. It is composed essentially of a 3-phase generator coupled with a 3-phase motor to transfer power in a main current path exclusively by current passing between the generator and the motor. For this reason, the system requires switching components having large dimensions, because all of the power must be transferred between the generator and the motor electrically.

The first sentence of the Abstract of the Rodenhuis document states that "the invention concerns a electro dynamic gear". Thus, there is no basis for the examiner's assertion that this reference discloses a magnetodynamic transmission.

The present invention is based on the completely different concept of transferring power magnetically instead of electrically. Thus, the present invention provides a magnetodynamic transmission, where the power is transferred via magnetic fields. This technology is completely foreign to Rodenhuis. In the main the Rodenhuis transmission is composed of a squirrel-cage rotor running asynchronously, where the

moving magnet field on the side of the rotor is supplied to the rotor by means of slip rings 17. In other words, this is a classical three-phase current asynchronous drive.

Short-circuiting rings 11, arranged outside the stator, are completely absent from transmissions according to the present invention, as are the bars 10 mentioned in the reference. It is essential that the electrical drive according to the reference be achieved by full, current-carrying coils 5, 6 and 18. As described in paragraph [0017] of the reference, stator turn 6 is connected with a three-phase bridge converter 6a that consists of the corresponding switching elements 26 connected to anti-parallel diodes. The three phases are X, Y, and Z, and all of the phases, r, s, t, u, v, w, x, y, and z, of the electrodynamic transmission have the same number of turns.

According to the reference, it is a disadvantage that the total power of the system is used in converter 6a to convert stator currents in stator 6, which results in a very high switching expenditure. High construction, manufacturing and maintenance costs of such electrodynamic transmissions are an additional disadvantage because the corresponding rotor currents must be supplied by slip rings 17, 18 as well. An own converter 18a is used for these slip rings, which requires a correspondingly high switching expenditure. Moreover, it is a disadvantage in the reference gear, that a converter 5a must be used, which, together with converter 6a, forms the duplex star at the stator. For example, these two stars can be seen on the left hand side of Figure 3 and must be driven with separated converters. For this reason, relatively high costs caused by the manufacture and maintenance of this transmission are a disadvantage of the electrodynamic transmission. In particular, this transmission has a very poor efficiency

because the main power for the stator and the rotor must be supplied repeatedly by means of converters and turns arranged correspondingly.

It is an additional disadvantage that the system disclosed by Rodenhuis often needs repair because of the wear and tear caused by slip rings used, brush light and the like and EMV interferences which reduce the lifetime of the transmission considerably. Because of additional turns used an essentially greater amount of copper is required in both the rotor and the stator, which results in poorer efficiency.

Strictly speaking, Rodenhuis discloses an electrodynamic machine comprising two rotors, where the above mentioned disadvantage (higher loss of copper) applies to both rotors. This reference concerns an infinitely variable electrodynamic transmission while the present invention provides a magnetodynamic transmission.

An electrodynamic transmission according, as disclosed by Rodenhuis, comprises a rotating field rotor provided with a slip ring, a squirrel-cage rotor and a stator provided with rotating field converters, resulting in an electrodynamic conversion. Hence, it follows that the mechanical power existing originally is completely converted into electrical power and then reconverted into mechanical power.

A magnetodynamic converter according to the present invention differs by the fact that only a small portion of the mechanical input power must be treated electrically, while the main portion of the mechanical power is directly converted into off-drive power by direct <u>magnetic</u> processes.

However, Rodenhuis lacks the feature that the machine comprises magnets arranged proportionally at the circumference. This is true only in the case of the present invention.

Moreover, Rodenhuis does not disclose that a field concentrator has stationary pole shoes that are magnetically conductive, which field concentrator is provided over a secondary air gap surrounded separately by a concentric stator.

A transmission having three converters and a capacitor provided between said converters is shown in Figure 7, which converters produce a voltage with energy flowing. Power is exchanged between the turns in a selected direction and add up to the nominal power. However, short circuits are produced only in a transmission according to the present patent invention. This means that no power up to the nominal power is exchanged via the corresponding switching elements; controlled short circuits are caused only which serve to reroute the magnetic field. Compared with the prior art cited, this is an essential difference because the invention uses controlled short circuits in the turns to drive the corresponding turns in the stator, while this feature is missing from Rodenhuis. In Rodenhuis, the turns may not be short-circuited sequentially because all three convertors must form a common intermediate circuit voltage, which is the voltage formed at the capacitor. This common intermediate circuit voltage is a d.c. voltage enables voltage to be transported to or withdrawn from turn 16 between stator turn 6 and 5, or both in common. This is a clear indication that these cannot be replaced by permanent magnets because no energy may be transported unless by rotation.

Therefore, it is the essence of the present invention to use a field concentrator provided with stationary magnetically conductive pole shoes and magnets 6 provided in drive rotor 7 arranged proportionally at the circumference, which results in the magnetodynamic transmission. For this reason it is not

required to maintain a direct current between two turns to be triggered because no energy is required to be transported between the corresponding turns arranged to each other. This is not disclosed by Rodenhuis.

The invention differs by providing an infinitely variable magnetodynamic transmission with a considerably minor switching expenditure and a more elegant method, which transmission is not disclosed by Rodenhuis. The stator turns in accordance with the invention serve for a completely different purpose, to reroute a magnetic field in a field concentrator and not to transport energy electrically between rotor and stator.

It is an essential advantage of the invention that mechanical power is transferred by means of magnetic flux rerouting and electric power is not supplied via windings or coils. These features are not disclosed in or suggested by Rodenhuis. For this reason, the invention shows the additional advantage that those electrical switching elements required for speed of rotation control purposes may have considerably smaller dimensions. Therefore, compared with Rodenhuis, the present invention is clearly unobvious.

The essential advantages provided by the present invention can be seen from a comparison of the features of the invention with the description in paragraph [0017] of Rodenhuis, which contains an explicit description of a three-phase bridge converter 5a, 6a, which has nothing to do with the present invention. In the present invention, the windings are sequentially short-circuited during operation. This mode of operation has nothing to do with that of the gear disclosed by Rodenhuis.

The rejection of claim 1 is additionally based on a U.S. patent to Schulze, which discloses an electrodynamic

transmission, a type of transmission that differs fundamentally from a magnetodynamic transmission. A transmission of the type disclosed by Schulze does not, and would not, include pole concentrator.

The Schulze transmission has two rotors that form a drive and an off-drive revolving a stator.

As shown in Figure 1 of Schulze, the difference relative to the present invention is that the two rotors are not arranged radially with respect to each other, but rather are offset axially from one another. Hence it follows that there is no flux in common and that no magnetic flux is flowing through elements 6, 7, and 11 in common. Therefore, winding 11 must obviously transfer the total power of the system by transporting energy between rotors 6 and 7.

This is an essential difference from the present invention in that, according to the present invention, windings are short-circuited to serve for field rerouting purposes.

According to the reference disclosure, winding 11 is used for energy transportation purposes. This means that a short-circuit allows a current in this region of the winding, which current encloses the region with a magnetic field exerting an effect on the magnets and therefore transporting energy from rotor to rotor. Since this may never happen always at the same time with different speeds of rotation, the reason for closing switch 18 is to produce synchronism between magnet poles 8 and 9 with respect to winding 11.

In contrast, the reason for the short circuits produced according to the present invention relates to the position of the field concentrator pole to the stator.

Thus, the Schulze disclosure concerns an electrodynamic transmission since winding 11 is supplied with energy by rotor

7, which energy is passed on to rotor 9. Therefore, the sum of all partial powers input corresponds to the sum of all partial powers output or transferred, which results in the need for expensive switching elements, which are mot needed in transmissions according to the present invention.

An electrodynamic transmission is provided if the entire transfer power is effected electrically and not magnetically, as in the present invention.

Also, Schulze discloses a driven drive rotor having magnets arranged proportionally at the circumference. However, in this case there are two drive rotors arranged one alongside the other in the axial direction, which has a negative influence on the structure of the motor. This means that a short circuit in the Schulze machine allows for a current produced by energy produced in this region of the wire, which current encloses this region with a magnetic field having an effect on this magnet and therefore, energy is transported from rotor to rotor. Since this may not happen always at the same time with different speeds of rotation, the reason for closing switch 18 is to produce synchronism between magnets 8 and 9 with respect to winding 11, while the reason for producing short circuits according to the present invention is to influence the position of the field concentrator pole relative to the stator.

Rotor 6 together with magnet 9 is essentially an identical arrangement to rotor 7 together with magnet 8. In contrast, in a transmission according to the present invention, one of the two rotors does not require permanent magnets. The field concentrator provided in the arrangement in accordance with the invention requires neither additional electrical nor mechanical elements except for iron.

A need for magnets on both rotating parts results in a structure that is more expensive.

Also, the feature of a coaxial field concentrator, particularly one having magnetically conductive pole shoes, is missing from the Schulze disclosure.

As regards short-circuiting windings, Schulze does not disclose sequential short-circuiting. This reference only mentions a winding and appears to illustrate a single winding that is selectively short circuited. Therefore, the short-circuit shown in Figures 2 and 4 of this reference serves to produce synchronism of the currents in winding 11 to the position of the magnets provided in rotor 6. Schulze does not disclose that magnetic power is transferred by sequential short-circuiting of windings, while in the case of the present invention mechanical power is transferred by magnetic flux rerouting; in the case of Schulze, rerouting is effected by electrical currents. Therefore, the same disadvantage exists as in the Rodenhuis machine, i.e. a relatively massive structure is required having poor efficiency at the same time. It is true that slip rings are not required on the side of the stator and that of the rotor. However, the principle of transferring electrical power is associated with very high expenditures on the side of the converter, which is avoided by the present invention.

The rejection of claim 3 and 4 is based on the references discussed above in combination with U.S. Pat. No. 4,532,447 (Cibie), which is commented on as follows:

Figure 2 of this reference shows pole shoes that are excited by a coil, whereas comparable pole shoes according to the present invention are excited by permanent magnets. The use of permanent magnets would not be at all possible in the

machine disclosed by Cibie because each and every pole shoe is triggered by a separate turn, which must also be triggered separately. Each turn belonging to one pole shoe must be triggered in another way in comparison with the adjacent turn, which results in a high switching expenditure. In contrast, the present invention provides pole shoes with permanent magnets, which results in a considerably lower expenditure. Again, Cibie concerns an electrodynamic transmission because it can be recognized from Figure 8 of this reference that all of the electrical power is transferred from one turn (101, 102', 103') to turns 107, 108, 109 in different directions of flux up to the nominal power. which results in high costs for switching means. As regards the internal air gap, it is associated with an internal pole generator excited by another source enclosed concentrically by an external pole generator. Therefore, Cibie employs a completely different setting principle. Pole shoes arranged to one another in the external and internal diameter are excited by different currents, which allows setting of the torque transferred.

In addition, the examiner cites U.S. Pat. No. 7,164,219, which is commented on as follows: In accordance with the title, this patent also does not disclose a magnetodynamic transmission, but rather an electromechanical transducer. The classical motor-generator principle is described in this reference, where alternating current is produced by a generator being rectified by a rectifier, then supplied to an alternating current element and converted into an alternating current that is supplied to a motor element. The result is a series-connected motor-generator arrangement with converter means provided in between. This reference shows concentric intermeshing of these two elements (motor and generator). However, there are no other similarities to the present

invention. In particular, this reference does not disclose a magnetodynamic transducer working with permanent magnets and the corresponding pole concentrators and, in addition, there is no setting of torque between the driven and off-drive elements by rerouting of the magnet flux between these two elements.

It is therefore requested that objections and rejections presented in the last action be reconsidered and withdrawn, that claims 9-24 be allowed and that the application be found in allowable condition.

If the above amendment should not now place the application in condition for allowance, the Examiner is invited to call undersigned counsel to resolve any remaining issues.

Respectfully submitted,

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